

Claims

1. A compositionally graded sintered alloy which comprises: 1 to 40% by weight of an iron group metal; 0.1 to 5 10% by weight of at least one specific metal element selected from the group consisting of Cr, Au, Ge, Cu, Sn, Al, Ga, Ag, In, Mn and Pb; a hard phase containing, as a main component, at least one compound selected from the group consisting of a carbide, a nitride and a mutual solid 10 solution of a metal(s) which belongs to Group 4 (Ti, Zr, Hf), 5 (V, Nb, Ta) or 6 (Cr, Mo, W) of the Periodic Table; and inevitable impurities, wherein the content of the specific metal element gradually increases from a surface of the sintered alloy toward an inner portion thereof, and 15 a ratio of the average concentration of the specific metal element in a region which is at least 1 mm inside from the surface of the sintered alloy, to the average concentration of the specific metal element in a region between the surface and the position which is 0.1 mm inside the 20 surface, of the sintered alloy, is 1.3 or more.
2. The compositionally graded sintered alloy according to Claim 1, wherein the specific metal element is at least one selected from the group consisting of Cr, Al and Mn.
- 25 3. The compositionally graded sintered alloy according to Claim 1, wherein the specific metal element is at least one selected from the group consisting of Au, Cu and Ag.
- 30 4. The compositionally graded sintered alloy according to Claim 1, wherein the specific metal element is at least one selected from the group consisting of Ge, Sn, Ga, In and Pb.
- 35 5. The compositionally graded sintered alloy according to Claim 1, wherein the ratio of the average concentration of

the specific metal element in a region which is at least 1 mm inside from the surface of the sintered alloy, to the average concentration of the specific metal element in a region between the surface and the position which is 0.1 mm  
5 inside the surface, of the sintered alloy is 2 to 20.

6. The compositionally graded sintered alloy according to Claim 1, wherein the content of the iron group metal gradually increases from a surface of the sintered alloy  
10 toward an inner portion thereof, and a ratio of the average concentration of the iron group metal in a region which is at least 1 mm inside from the surface of the sintered alloy, to the average concentration of the iron group metal in a region between the surface and the position which is  
15 0.1 mm inside the surface, of the sintered alloy, is 1.1 or more.

7. The compositionally graded sintered alloy according to Claim 1, wherein the content of the specific metal element  
20 is 5 to 50% by weight based on the content of the iron group metal.

8. The compositionally graded sintered alloy according to Claim 1, wherein the hard phase comprises tungsten carbide,  
25 or tungsten carbide and a cubic system compound comprising at least one of compound selected from a carbide, a nitride and a mutual solid solution of a metal(s) which belongs to Group 4, 5 or 6 of the Periodic Table.

30 9. The compositionally graded sintered alloy according to Claim 1, wherein the hard phase comprises 30% by weight or more of at least one selected from the group consisting of a carbide, a nitride and a carbonitride of titanium, and the remainder being at least one selected from the group  
35 consisting of a carbide, a nitride and a carbonitride of a metal which belongs to Group 4, 5 or 6 of the Periodic

Table, provided that titanium is excluded.

10. A method of producing the compositionally graded sintered alloy which comprises the steps of:

- 5       (1) obtaining mixed powder by pulverizingly mixing 1 to 40% by weight of powder of an iron group metal, 0.1 to 10% by weight of powder of a specific metal element as at least one type of element selected from the group consisting of Cr, Au, Ge, Cu, Sn, Al, Ga, Ag, In, Mn and Pb, and  
10 powder for forming a hard phase, as a remainder, comprising at least one compound selected from the group consisting of a carbide, a nitride and a mutual solid solution of a metal(s) which belongs to Group 4 (Ti, Zr, Hf), 5 (V, Nb, Ta) or 6 (Cr, Mo, W) of the Periodic Table;
- 15      (2) molding the mixed powder into a predetermined shape, thereby obtaining a green compact;
- 20      (3) holding the green compact in an inactive atmosphere of which pressure is kept no lower than the vapor pressure of the specific metal element and heating the green compact therein to 1250 to 1550°C, thereby effecting sintering; and
- 25      (4) in a temperature range between the temperature at which the powdery mold has been held and heated and the temperature at which the liquid phase begins to solidify, changing the state of the inactive atmosphere to a state in which the pressure of the inactive atmosphere is no higher than the vapor pressure of the specific metal element.